

# Wind Power GeoPlanner™

## Licensed Microwave Report

Big Blue



Prepared on Behalf of  
Exergy Development  
Group

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## **1. Introduction**

The use of wind energy, one of the oldest forms of harnessing a natural energy source, is now one of the world's fastest growing alternative energy sources. The United States is committed to the use of wind energy, and over the next several years billions of dollars will be spent on wind power projects. However, as new wind turbine generators are installed around the country, it is important to note that they may pose an interference threat to existing microwave systems and broadcast stations licensed to operate in the United States.

Wind turbines can interfere with microwave paths by physically blocking the line-of-sight between two microwave transmitters. Additionally, wind turbines have the potential to cause blockage and reflections ("ghosting") to television reception. Blockage is caused by the physical presence of the turbines between the television station and the reception points. Ghosting is caused by multipath interference that occurs when a broadcast signal reflects off of a large reflective object—in this case a wind turbine—and arrives at a television receiver delayed in time from the signal that arrives via direct path.

Many states and other jurisdictions recognize the need for regulations addressing interference to radio signal transmissions from the wind turbine installations. Specifically, local planning authorities typically require project developers to ensure wind turbines will not cause interference. In some cases they require developers to notify the telecommunication operators in the area of the proposed wind turbine installation. Other factors prompting developers to undertake proactive investigation into potential interference include the need to prevent legal and regulatory problems and the desire to promote goodwill within the community—a good neighbor approach.

Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services.

This report focuses on the potential impact of wind turbines on licensed non-federal government microwave systems. Comsearch provides additional wind energy services, a description of which is available upon request.

## 2. Summary of Results

An overall summary of results appears below.

### Project Information

Name: Big Blue

County: Martin (MN), Faribault (MN), and Kossuth (IA)

State: Minnesota and Iowa

Total Microwave Paths	Paths with Obstructions	Total Turbines	Turbine Obstructions
15	N/A	N/A	N/A

### Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed paths from 0.9 - 23 GHz<sup>1</sup>. First, we determined all microwave paths that intersect the area of interest, regardless of the proximity of their perspective antenna locations<sup>2</sup>. The area of interest was defined by the planned turbine location. Next, for each microwave path that intersected the project area, we calculated a Worst Case Fresnel Zone (WCFZ). The mid-point of a full microwave path is the location where the widest (or worst case) Fresnel zone occurs. Fresnel zones were calculated for each path using the following formula.

$$R_n \cong 17.3 \sqrt{\frac{n}{F_{GHz}} \left( \frac{d_1 d_2}{d_1 + d_2} \right)}$$

Where,

- $R_n$  = Fresnel Zone radius at a specific point in the microwave path, meters
- $n$  = Fresnel Zone number, 1
- $F_{GHz}$  = Frequency of microwave system, GHz
- $d_1$  = Distance from antenna 1 to a specific point in the microwave path, kilometers
- $d_2$  = Distance from antenna 2 to a specific point in the microwave path, kilometers

<sup>1</sup> Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

<sup>2</sup> We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

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For worst case Fresnel zone calculations,  $d_1 = d_2$

The calculated WCFZ radius, giving the linear path an area or swath, buffers each microwave path in the project area. See the Tables and Figures section for a summary of paths and WCFZ distances. In general, this is the two-dimensional area where the planned wind turbines should be avoided, if possible. A depiction of the WCFZ overlaid on topographic basemaps can be found in the Tables and Figures section, and is also included on the enclosed spreadsheet and shapefiles<sup>3</sup>.

### **Discussion of Potential Obstructions**

For this project, turbine locations were not provided; thus we could not determine if any potential obstructions exist between the planned wind turbines and the incumbent microwave paths. If the latitude and longitude values for turbine locations are provided, Comsearch can identify where a potential conflict might exist.

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<sup>3</sup> The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 15 projected coordinate system.

### 3. Tables and Figures

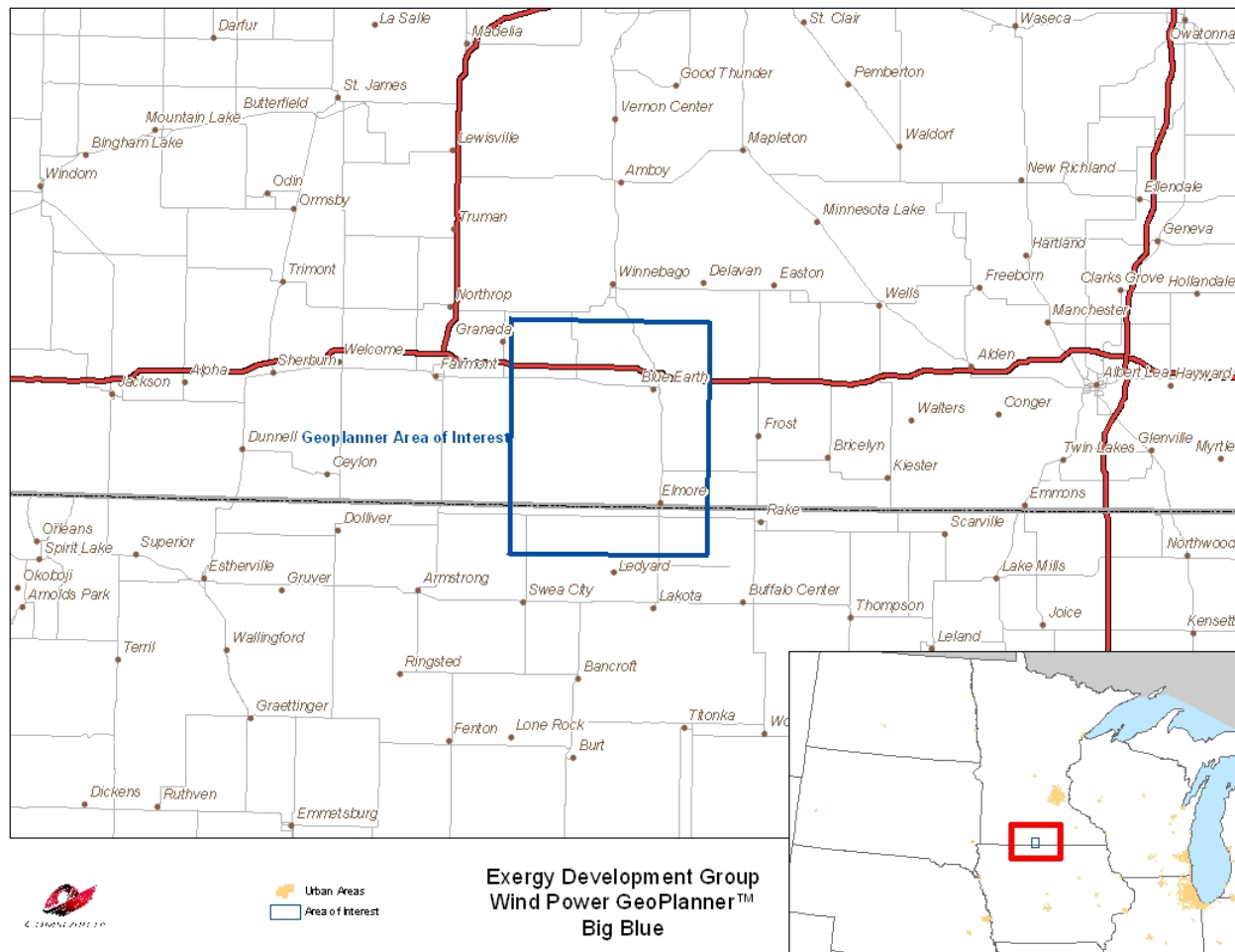


Figure 1: Area of Interest



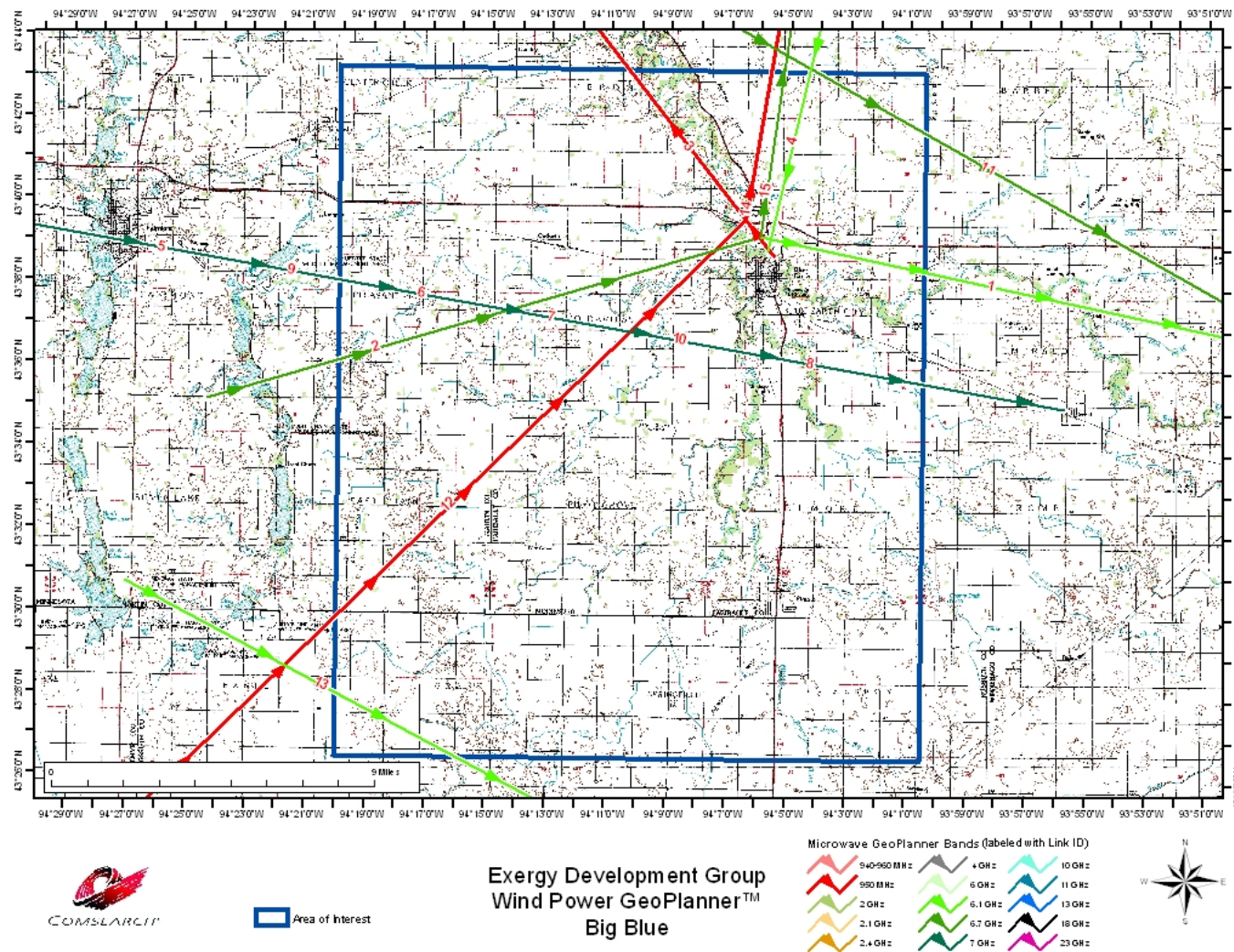
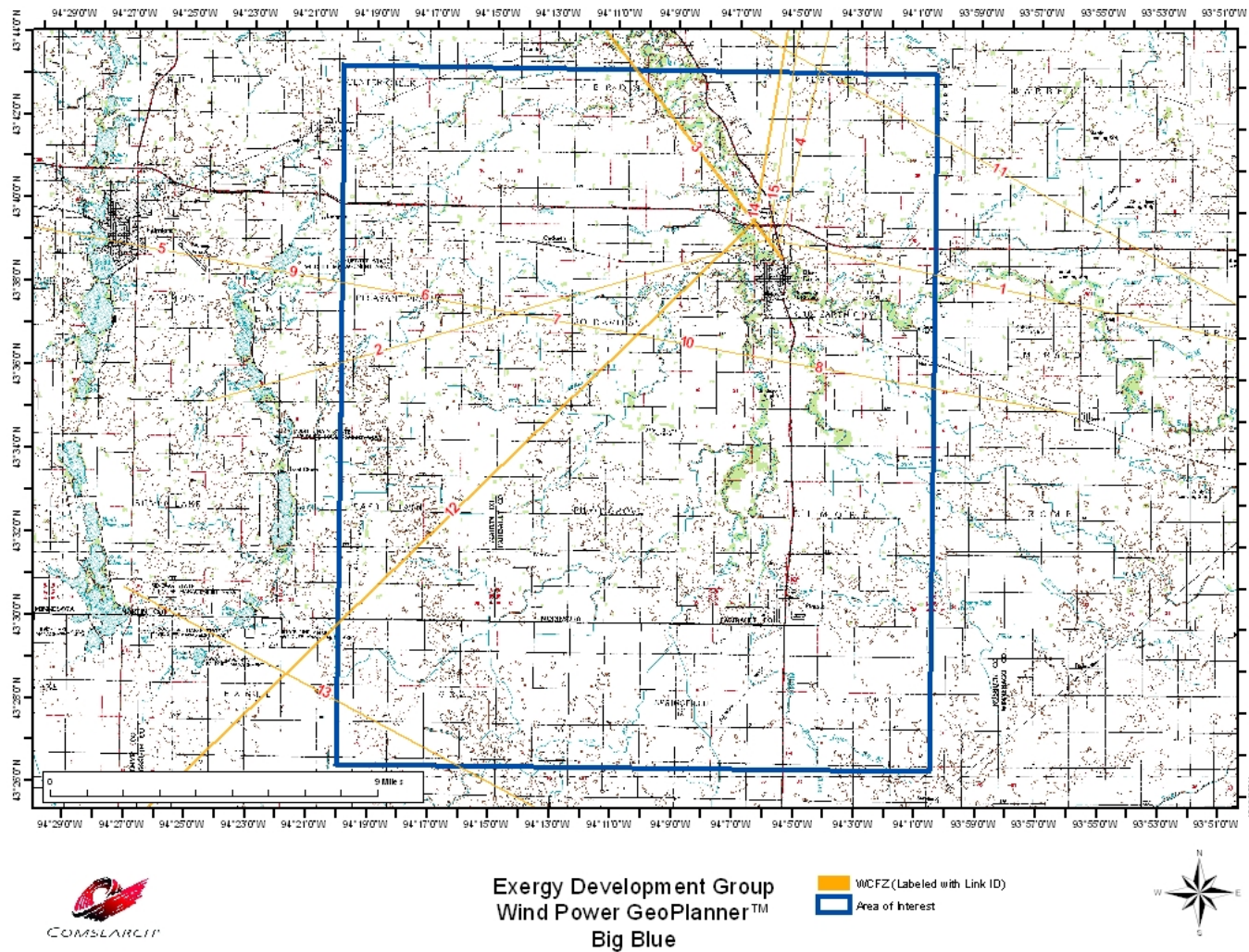


Figure 2: Microwave Paths that Intersect the Area of Interest



*Figure 3: Microwave Paths with WCFZ Buffers*



ID	Site Name 1	Site Name 2	Callsign 1	Callsign 2	Band	Licensee	WCFZ (m)
1*	BLUE EARTH	WALTERS	BLUEEART	WALTERS	Lower 6 GHz	Minnesota, State of (DOT)	18.77
2*	FAIRMONT	BLUE EARTH	FAIRMONT	BLUEEART	Upper 6 GHz	Minnesota, State of (DOT)	17.00
3	BLUE EARTH	LEWISVILLE	KZG27	RXONLY	950 MHz	THREE EAGLES OF LUVERNE, INC.	56.76
4	MANKATO	BLUE EARTH	WHO382	RXONLY	Lower 6 GHz	Time Warner Cable LLC	26.38
5	WELCOME	FROST	WMV512	RXONLY	7 GHz	FEDERATED RURAL ELECTRIC ASSOCIATION	24.39
6	WELCOME	FROST	WMV518	RXONLY	7 GHz	FEDERATED RURAL ELECTRIC ASSOCIATION	24.39
7	WELCOME	FROST	WMV519	RXONLY	7 GHz	FEDERATED RURAL ELECTRIC ASSOCIATION	24.39
8	WELCOME	FROST	WMV520	RXONLY	7 GHz	FEDERATED RURAL ELECTRIC ASSOCIATION	24.39
9	WELCOME	FROST	WMV521	RXONLY	7 GHz	BLUE EARTH NICOLLET FARIBAULT	24.39
10	WELCOME	FROST	WMV535	RXONLY	7 GHz	FEDERATED RURAL ELECTRIC ASSOCIATION	24.39
11	WINNEBAGO	WALTERS	WNTP304	WNTP305	Upper 6 GHz	INTERSTATE POWER AND LIGHT COMPANY	23.10
12	SLC ELEVATOR	KJLY RADIO	WQDK323	RXONLY	950 MHz	MINN - IOWA CHRISTIAN BROADCASTING INC	57.68
13	EAST CHAIN	CRYSTAL LAKE	WQDT293	WQDT294	Lower 6 GHz	Northern Border Pipeline Company	27.43
14	KJLY STUDIO	KJLY XMTR	WQJV845	RXONLY	950 MHz	MINN - IOWA CHRISTIAN BROADCASTING INC	46.99
15	BLUE EARTH	MAPLETON	WQLL673	WQJF953	Upper 6 GHz	Minnesota, State of (DOT)	17.90

\* Status is "Proposed" and the path may not be fully constructed.

*Table 1: Microwave Paths that Intersect the Area of Interest*

*(See enclosed mw\_geopl.xls for more information and  
GP\_dict\_matrix\_description.xls for detailed field descriptions)*

## **4. Contact Us**

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